Additional Questions for the Record

Hearing entitled "Midterm Review and an Update on the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles"

Subcommittee on Commerce, Manufacturing, and Trade and the Subcommittee on Energy and Power

Questions submitted to John German, ICCT

The Honorable Michael C. Burgess M.D.

In your opinion, are advances in conventional internal combustion engine technology (i.e. non-hybrid) sufficient by themselves to achieve the current standards for model year 2025? If not, could you please your estimates for how much of each of the following technologies (as defined in the TAR) will be required to achieve the current standards for model year 2025: (a) mild hybrid; (b) full hybrid; (c) plug-in hybrid electric vehicle; and (d) electric vehicle.

Answer:

Advances in conventional internal combustion engine, transmission, and thermal management technology, combined with reductions in tire rolling resistance, aerodynamic drag, and weight, will be sufficient to achieve the current standards for model year 2025 without the need for full hybrid vehicles.

In the TAR, EPA projected that in 2025 full hybrids would be 3% of the fleet and mild hybrids would be 18%. As I documented in my written comments, even the updated technology estimates in the TAR did not include several important technologies that are already in production or for which production plans have been announced, such as e-boost and variable compression ratio. Further, EPA only included 4% market penetration for Miller cycle engines in 2025 and 7% weight reduction. The market potential in 2025 for Miller cycle is more likely to be about 40% and 15% weight reduction is also feasible by 2025. Thus, the technology estimates in the TAR are conservative and fewer hybrids will be needed than forecasted by the agencies. In particular, no full hybrids will be needed.

Another new technology that has just been introduced into the fleet is 48v hybrid systems. Delphi recently stated that 48v hybrids can get 70% of the benefit of a full hybrid system at 20-30 percent of the cost.[1] 48v hybrid systems will be just as cost-effective as many other technologies available to manufacturers and will be used by manufacturers as needed. The estimate in the TAR for 18% mild hybrids is a reasonable estimate of the penetration of 48v hybrids in 2025.

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[1] Automotive News, "DELPHI'S KEVIN CLARK: Supplier sees early payoff from autonomous vehicles, October 3, 2016, www.autonews.com/article/20161003/OEM02/310039994/delphis-kevin-clark%3A-supplier-sees-early-payoff-from-autonomous

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According to Table ES-3 of the TAR, EPA's compliance pathway for meeting the MY2025 GHG standards envisions that 44% of vehicles would use higher compression ratio, naturally aspirated gasoline engines. If a manufacturer does not have that type of engine in any of its vehicles today, what steps would it have to take in order to integrate that type of engine in its product line, and how long would it take for it to reach a 44% penetration rate?

Answer:

It is likely that all manufacturers are already developing higher compression ratio, naturally aspirated engines, at least for evaluation, in response to the major leap in efficiency with Mazda's production of the SkyActiv engine in 2014. But even assuming that a manufacturer did not have higher compression ratio naturally aspirated engines already in development, it would take a maximum of 5 years for a manufacturer to completely develop such a system. This includes 2-3 years for initial development and testing (which most manufacturers have likely already done) and another 2 years or so for a pilot program. After that, the engine could be rolled out into the fleet as part of a manufacturer's normal product redesign cycle, or roughly 20% of its fleet each year. Thus, if desired, any manufacturer could easily meet EPA's projected penetration rate of 44% by 2025.

However, it is important to understand that this is only one of a large number of potential pathways to comply with the standards. EPA and NHTSA make their best estimates of the technologies that manufacturers will put into production, but manufacturers are free to develop the technologies they think will work best for them. Thus, for example, some manufacturers may focus on downsized, turbocharged gasoline engines and eliminate all use of naturally aspirated engines by 2025. Other manufacturers may decide to use a lot more than 44% naturally aspirated engines by 2025, invest in a high penetration of 48v hybrid systems, market a large number of diesel engines, or push the frontier into carbon fiber for 30% weight reductions. Each manufacturer will choose it's own path and there are many, many ways to comply.

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In the TAR, the EPA states that in its modeling, "the California Zero Emission Vehicles (ZEV) program is considered in the reference case fleet; therefore, 3.5% of the fleet is projected to be full EV or PHEV in the 2022-2025 timeframe due to the ZEV program and the adoption of that program by nine additional states." Sine a significant portion of the required GHG reductions will be met through manufacturing electric-drive vehicles for the ZEV mandate, shouldn't EPA have considered those costs in its assessment of the costs of the regulation? If EPA had considered the costs of producing electric-drive vehicles, what impact would that have on the cost estimates in the TAR?

Answer:

The agencies have appropriately incorporated electric vehicles into their projections for 2025 technology penetration. Relatively few electric vehicles will be necessary to minimally comply with the 2025 federal greenhouse gas emission standards, due to the high availability of low-cost non-electric vehicle technologies. However, the agencies have accurately reflected how the prospects for electric vehicles have improved markedly in just the past several years, and that many companies are deciding to innovate and deploy technology in this area. EPA's incorporation of industry compliance with the California Air Resources Board's Zero-Emission Vehicle regulation as part of its reference fleet assessment is entirely appropriate. This is appropriate as it reflects a clear industry trend to, at a minimum, comply with ZEV standards, and it follows the agencies' precedent of including adopted regulatory compliance in the baseline reference fleet projection. The costs of complying with the ZEV program are appropriately assigned to the ZEV program. Including the costs again in EPA's GHG standards would double count the costs, which is not appropriate.